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Inflation in developing Asia: pass-through from global food and oil price shocks

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The world economy experienced a sharp spike in food and oil prices during 2007 and 2008. In light of developing Asia's dependence on imported oil and food, we can expect higher global food and oil prices to result in higher domestic consumer prices in the region. However, the actual impact of the global commodity shocks on consumer price inflation in developing Asia depends on a number of other factors, including government policy measures. The objective of this paper is to examine empirically the extent of the pass-through of global food and oil prices to domestic consumer prices in nine countries in the region. The main empirical result is that the magnitude of the pass-through has been limited. Government policy measures, for example, subsidies and price controls, played a role in reducing or delaying the pass-through of oil and food price increases to domestic prices.

Introduction

Prior to the intensification of the global financial turmoil in the latter part of 2008 and the consequent deterioration of the global economic outlook, policymakers in developing Asia were preoccupied with a surge in global commodity prices. In particular, oil prices had risen continuously since 2003, and the increase had accelerated since 2007, while rising global food prices were a more recent phenomenon, which began in 2006. Both food and oil prices have softened since the second half of 2008 along with the gathering economic gloom. Concurrently with the global commodity price shocks, developing Asia experienced a surge in inflation during 2007 and 2008. Inflation, as measured by consumer price indices, gathered momentum throughout 2007 and accelerated sharply in the first half of 2008. Higher inflation engulfed virtually all of developing Asia, although the magnitude of the increase differed across countries. Given the almost perfect coincidence of the global commodity price shocks and the surge in developing Asia's inflation, there was an almost automatic presumption that the region was suffering from a bout of externally driven cost-push inflation.

There are various channels, both direct and indirect, through which higher international food and oil prices can lead to higher domestic consumer prices. Higher oil prices have a largely indirect effect on consumer prices whereas higher food prices have a more direct effect. This is because oil is a productive input but food is consumed directly. An increase in oil prices will increase the cost of production because oil is a universal input, required to

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produce virtually all goods and services. As food accounts for a sizable part of the consumption basket in developing countries, an increase in food prices has a sizable impact on the overall consumer price level. Although the transmission of the global commodity shocks to domestic consumer prices is straightforward in theory, it is far from straightforward in practice. In developing countries, the government often subsidises the price of basic necessities such as food and fuel for political reasons, which means that consumers do not face the market price of those goods. To the extent that government subsidies distort the price of food and oil products, consumer prices will not fully adjust to higher global prices. Producers also tend to pass on higher input prices to consumers only after a time lag, especially if they face a competitive market environment. Exchange rate movements may also interfere with the transmission of commodity shocks into domestic inflation. For example, the weakening of the US dollar lowers the domestic-currency price of oil because oil is denominated in dollars.

The extent to which higher global food and oil prices translate into higher domestic prices is ultimately an empirical question. The central objective of this paper is to examine empirically the extent of the pass-through of global food and oil prices to domestic consumer prices in nine developing Asian countries: Peoples' Republic of China (PRC), India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand, and Vietnam.[1] A high pass-through would imply that global commodity price shocks are a significant determinant of inflation in the region. On the other hand, a low pass-through implies that the region's prices are largely insulated from global commodity price shocks and depend instead on other factors such as the state of aggregate demand and monetary policy. The rest of this paper is organised as follows. The second section looks at trends in global food and oil prices as well as the region's inflation during the 2007–09 period. The third section presents the data and empirical methods used to estimate the extent of pass-through. The fourth section reports and discusses the main findings. The fifth section concludes with a discussion of the main findings and policy implications that emerge from the analysis.

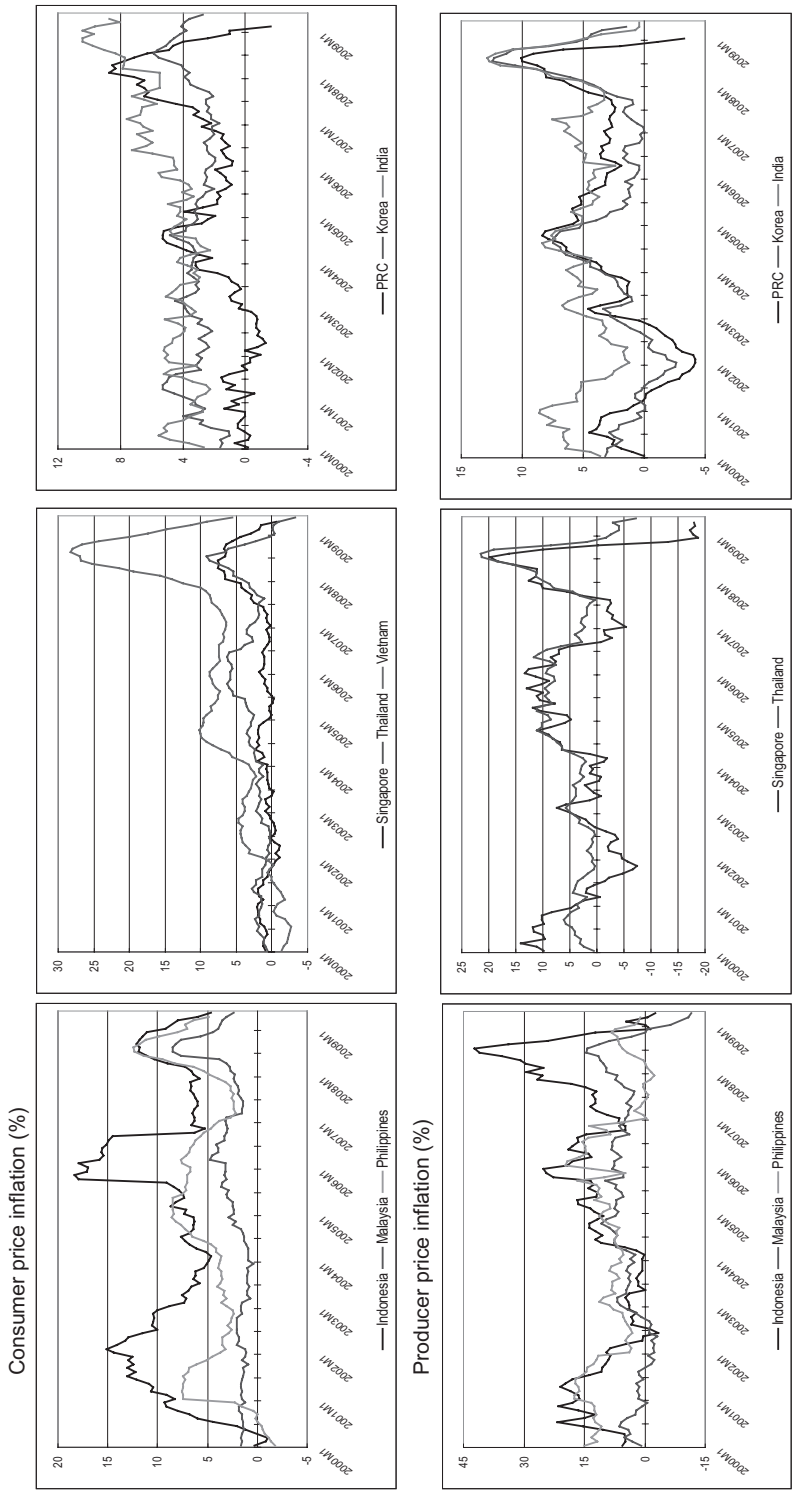
Recent trends in Asian inflation and global commodity prices

Before delving into the main task of investigating the relationship between global commodity prices and inflation in developing Asia, it is worthwhile to take a look at the trends in the two sets of variables over the past few years. During the course of 2007 and 2008, high inflation emerged as the main risk to the macroeconomic outlook of developing Asia, although this risk has receded since the latter part of 2008 because of the global economic downturn. Another set of variables to examine is exchange rate movements, because these affect the extent of the pass-through of dollar-denominated global commodity prices into domestic prices. Finally, as the most fundamental macroeconomic variable is GDP growth, we also examine developing Asia's recent growth performance.

Figure 1 shows inflation during 2000–09Q1 in the nine developing Asian countries. Producer and consumer price inflation measures in the region increased noticeably after early 2007. In Viet Nam, consumer price inflation accelerated to almost 25 per cent year-on-year in early 2008, while in the PRC it jumped to almost 9 per cent in the second quarter of 2008, from less than 2 per cent in 2006. In the first quarter of 2008, Indonesia's inflation surged to almost 7.6 per cent. Producer prices rose even faster than consumer prices in almost all countries. This was especially the case in Indonesia, where producer price inflation soared to 25 per cent year-on-year in 2008Q1 compared with 10 per cent in early 2007.

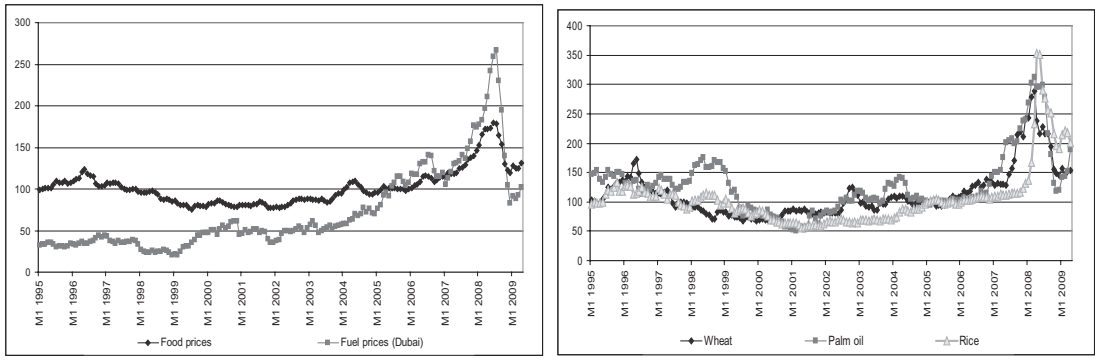
1 The nine countries were chosen because of their size. Collectively, they account for a large share of developing Asia's total output.

Figure 1
Consumer and producer prices inflation, 2000–08



Source: International Monetary Fund, International Financial Statistics online database.

Figure 2
Food and fuel prices (2000 = 100), 1995:M1–2009:M4



Source: International Monetary Fund, International Financial Statistics online database.

The picture changed significantly after the second half of 2009. Producer and consumer price inflation both declined noticeably. In particular, producer price inflation slowed down in almost all of the countries under review in the first quarter of 2009, while PRC, Singapore, and Thailand experienced a slowdown in consumer price inflation. The deceleration of producer price inflation was most pronounced in Singapore, followed by Malaysia, Thailand, and the PRC, while consumer price inflation was arrested markedly in Vietnam, PRC, and Thailand.

The Brent crude oil price[2] peaked at a record high of US$140 per barrel in early 2008, up from less than US$60 in early 2007. The run-up in oil prices was driven mostly by the fundamentals of demand and supply. Surging global demand and the inability of global supply to keep pace generated upward price pressure. Food prices increased sharply after 2007, particularly for rice, palm oil, and wheat. These prices rose 62, 94, and 107 per cent, respectively, in the first quarter of 2008, compared with 39 per cent for overall food prices. The price of maize, a close substitute for wheat, increased by 30 per cent, and the prices of other edible oils, such as soybean and coconut, rose by almost 90 per cent.

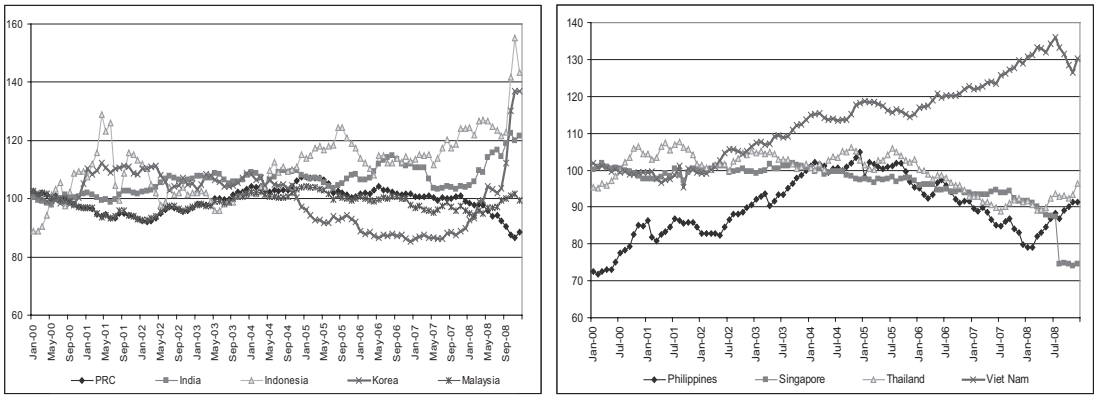
While the causes of the escalation in the prices of staple foods are complex, one important structural factor has been the rapid economic growth of the PRC and India. Their rising consumption has lifted the prices of a variety of food commodities. Global demand has simply outpaced global supply.[3]

However, fuel prices dropped rapidly after September 2008 to US$41 per barrel in December 2008 before rebounding to US$60 in May 2009. The global economic downturn exerted downward pressure on fuel prices. Food prices also declined but at a slower rate than fuel prices. This difference could be because of the nature of food products, which are more of a necessity than oil products (Figure 2).

One factor that may help to limit the pass-through of higher global commodity prices into higher domestic prices is exchange rate movements. During the period of high fuel and food prices, currency appreciation [in terms of the nominal effective exchange rate (NEER)] was evident in many Asian countries, as shown

2 Brent crude is the largest of the many classifications of oil and is sourced from the North Sea. The Brent crude oil maker is also known as Brent blend, London Brent, and Brent petroleum. It is used to price two-thirds of the world's internationally traded crude oil supplies.
3 For a comprehensive analysis of food prices and inflation in Asia, refer to ADB (2008a and 2008b).

Figure 3
Nominal effective exchange rates, 2000–08



Note: An increase reflects exchange rate depreciation.
Source: Authors' calculations.

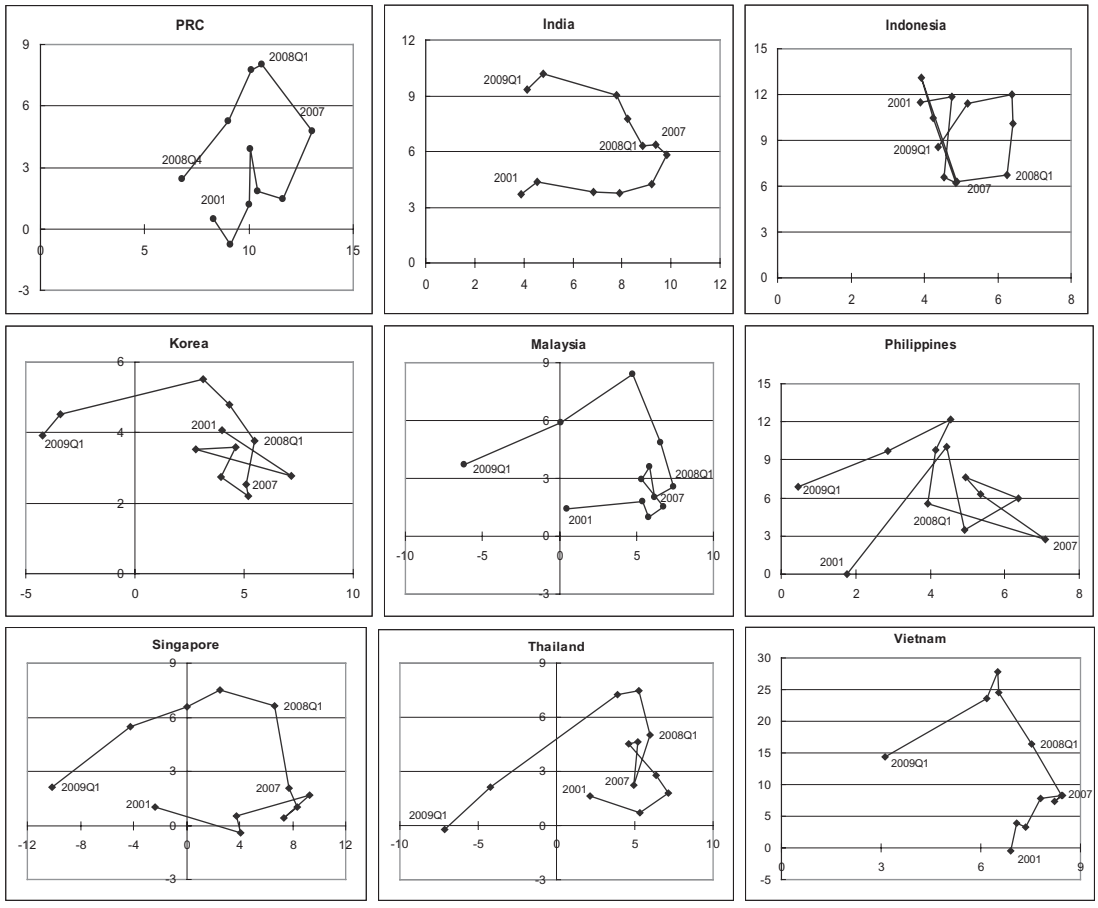
in Figure 3. In the Philippines, the NEER appreciated by 25 per cent during 2005–08, while in the PRC, Malaysia, Singapore, and Thailand appreciation was around 10 per cent during this period. Following the intensification of the global financial crisis, regional currencies generally depreciated, with the exception of the PRC and Singapore, which have seen their currencies strengthen. Currency depreciation should increase both producer and consumer prices to some degree, but its effect was obviously smaller than that of the economic downturn and the decline in commodity prices. As a result, both consumer and producer prices declined.

Output growth did not suffer much during the surge of inflation in 2007–08, but the marked slowdown in economic growth after the second half of 2008 went hand in hand with the deceleration of inflation. The limited impact of inflation on output growth in 2007–08 may have been due to the fact that the inflation surge was driven by a demand shock. If the surge was driven by a negative supply shock, the impact on output growth would have been more pronounced. This point is explained in greater detail in the fourth section. Figure 4 shows that an increase in inflation in Indonesia, Korea, Malaysia, and Thailand during 2006–08Q1 was accompanied by an increase in growth. Growth lost ground marginally in India, Singapore, Viet Nam, and the Philippines, but the growth rate was still above 5 per cent for all four countries. However, during 2008Q3–09Q1, economic growth decelerated in all Asian countries: in Singapore, Thailand, Malaysia, and Korea, real GDP contracted by 10.1, 7.1, 6.2, and 4.3 per cent, respectively. Economic growth thus replaced inflation as the dominant macroeconomic concern of policymakers.

Data and method

In this section, we discuss the model, data, and econometric procedure used in the analysis. A vector autoregression (VAR) model is estimated and a recursive Cholesky orthogonalisation is applied to identify the primitive shock in the VAR. This approach is used to model the dynamic inter-relationship between the price variables in the distribution chain. The ordering and choice of variables is motivated by the idea that prices are revised at each of three stages, that is, imports, production, and consumption, which together make up a stylised distribution chain of goods. The model controls for external shocks and aggregate

Figure 4
Inflation and growth in developing Asia, 2001–09Q1



Note: The X-axis is GDP growth and the Y-axis is consumer price inflation.
Source: International Monetary Fund, International Financial Statistics online database and CEIC database.

demand pressures. The model applied here is based on McCarthy (1999), Bhundia (2002), and Duma (2008) but is extended to include food prices.

In the model, inflation at each stage in the distribution chain, namely import prices (Equation 1.5), producer prices (Equation 1.6), and consumer prices (Equation 1.7), is composed of seven components. The first two components, that is, oil (π^{oil}) and food (π^{food}) price inflation, capture the effect of international supply shocks on inflation (referred to here as cost-push inflation). The third component, namely output gap (y), captures the demand shock while the fourth component measures the effect of the exchange rate shock (e) on inflation. The fifth component measures the effect of shocks to inflation at the previous stage of the distribution chain; and the sixth component captures the effect of shocks at the current stage. For example, in Equation 1.5, import price inflation at period t (π^{im}) is

influenced by its own inflation expectation,[4] the oil price shock, the food price shock, output gap changes, and the exchange rate changes. For producer prices [Equation 1.6, (π^{p})], in addition to its own inflation expectation, the oil price shock, food price shock, output gap changes, and exchange rate changes, the change in import price inflation is included in the model. Thus, import price inflation (π^{im}) affects consumer price inflation (π^{C}) both directly (ε_t^{im}) and indirectly through its effects on producer price inflation (ε_t^{p}). The seven components can be written as in Equation 1.

$$\pi^{oil} = E_{t-1}(\pi_t^{oil}) + \varepsilon_t^{oil} \quad (1.1)$$

$$\pi^{food} = E_{t-1}(\pi_t^{food}) + a_1\varepsilon_t^{oil} + \varepsilon_t^{food} \quad (1.2)$$

$$y_t = E_{t-1}(y_t) + b_1\varepsilon_t^{oil} + b_2\varepsilon_t^{food} + \varepsilon_t^{y} \quad (1.3)$$

$$\Delta e_t = E_{t-1}(\Delta e_t) + c_1\varepsilon_t^{oil} + c_2\varepsilon_t^{food} + c_3\varepsilon_t^{y} + \varepsilon_t^{\Delta e} \quad (1.4)$$

$$\pi_t^{im} = E_{t-1}(\pi_t^{im}) + d_1\varepsilon_t^{oil} + d_2\varepsilon_t^{food} + d_3\varepsilon_t^{y} + d_4\varepsilon_t^{\Delta e} + \varepsilon_t^{im} \quad (1.5)$$

$$\pi_t^{p} = E_{t-1}(\pi_t^{p}) + e_1\varepsilon_t^{oil} + e_2\varepsilon_t^{food} + e_3\varepsilon_t^{y} + e_4\varepsilon_t^{\Delta e} + e_5\varepsilon_t^{im} + \varepsilon_t^{p} \quad (1.6)$$

$$\pi_t^{c} = E_{t-1}(\pi_t^{c}) + f_1\varepsilon_t^{oil} + f_2\varepsilon_t^{food} + f_3\varepsilon_t^{y} + f_4\varepsilon_t^{\Delta e} + f_5\varepsilon_t^{im} + f_6\varepsilon_t^{p} + \varepsilon_t^{c} \quad (1.7) \quad (1)$$

where ε_t^{oil}, ε_t^{food}, ε_t^{y}, and $\varepsilon_t^{\Delta e}$ are the shocks corresponding to the supply, demand, and exchange rate shocks. ε_t^{im}, ε_t^{p}, and ε_t^{c} are the shocks emerging from import, producer, and consumer price inflation; and E represents expectations.[5]

Aggregate demand is proxied by the output gap, which is the gap between actual and potential output or the level of output consistent with non-accelerating inflation. Actual output is real GDP while potential output is proxied by the trend of real GDP, derived from the Hodrick–Prescott filter. Other methods, such as exponential smoothing and the Kalman filter, provide virtually identical results; but the Hodrick–Prescott filter was selected because it performed the best in terms of both explanatory and predictive power and diagnostic tests. Potential output is an exogenous variable in the model. Therefore, changes in the output gap purely reflect movements of aggregate demand. An increase in this variable thus implies upward pressure of aggregate demand. In particular, a value of the output gap greater than one reflects excess aggregate demand.

The transmission mechanism of the model in determining sources of inflation is as follows. Suppose there is an exogenous shock from international oil prices. International food prices would immediately adjust (on a quarterly basis in this study). Changes in international oil and food prices would affect aggregate demand, while the exchange rate would respond to the oil and food price hike as well as changes in aggregate demand. That is, the exchange rate adjusts as a result of changes in the balance of payments position. Changes in international oil and food prices, together with changes in the exchange rate, then affect import prices. This results in an impact on producer and consumer price inflation, as well as on aggregate demand. Import prices affect consumer prices in two ways, directly, that is, because some imported products are consumed directly and indirectly through producer prices. In the next period, changes in consumer prices feed back to aggregate demand, the exchange rate, import demand, and producer prices through their effect on expected inflation.

This process also describes a food price shock, except that changes in international food prices affect international oil prices in future periods. Note that in this model the degree of endogeneity increases as the order is moved down. This may create the problem of a recursive structure because prices can feed back to aggregate demand within a period of one

4 Note that the expected inflation at each stage is based on information available at period $t - 1$.

5 The formation of inflationary expectations could have both backward-looking and forward-looking components (Ball 2000; Choudhri and Hakura 2001; Mankiw et al. 2003). However, previous studies such as McCarthy (1999), Bhundia (2002), and Duma (2008) found that backward-looking expectations better explain domestic prices in developing Asia. In addition, we recognise that in developing Asia we do not have reliable forward-looking indicators as in industrial countries with well-developed financial systems.

quarter, the frequency of the data set. Therefore, alternative orderings of variables should be estimated to check for the robustness of the results.

The model was estimated for the period 1996Q1–2008Q1. However, in the PRC and Viet Nam the estimation period is 1999Q1–2008Q1 because of lack of a quarterly producer price index and quarterly GDP, respectively. For Indonesia and Malaysia, because of the lack of information on import prices, the estimation covers the period 2000Q1–08Q1. Dubai, the spot UK Brent, and the average of UK Brent, Dubai, and West Texas Intermediate oil prices are used to measure global oil prices. Food prices are measured by the weighted average of 21 commodity prices, provided by the International Monetary Fund's International Financial Statistics (IFS).[6] The bilateral exchange rates and NEERs (trade weighted) are used to check the sensitivity of the results. The measure of import prices, in domestic currency, varies among countries. In Thailand, the unit value of imports is applied while in Korea and Singapore, the actual import price data are used. For India, Indonesia, and Malaysia, a deflator derived from quarterly imports of goods and services was used. Because of data limitations, import prices are excluded from the PRC's and Viet Nam's estimations while producer prices are excluded for Viet Nam. The exclusion of these variables may lead to an underestimation of the pass-through of external shocks into inflation in these countries.

Data for oil, food, consumer and producer prices; bilateral exchange rates, NEERs of the PRC, Malaysia, the Philippines, and Singapore; import prices for Korea, Thailand, and Singapore; and the industrial production index for the PRC were obtained from the IFS. The GDP data are from the CEIC database while the NEER data for India, Indonesia, Korea, Thailand, and Viet Nam are from country sources.

Based on the Augmented Dickey–Fuller test, all variables were found to be non-stationary, I(1), with the exception of the output gap (y), which exhibits stationarity, I(0). No co-integration was found between the variables with the output gap entering as a stationary variable. Thus, the VAR model was estimated in first differences to avoid the spurious regression problem. The diagnostic tests, comprising the Autoregressive (AR) root test (stability condition), the autocorrelation Lagrange Multiplier (LM) test, the normality test, and the White heteroskedasticity test, were applied. A visual inspection of the residuals was also performed to ensure that there are no major outliers. To determine the appropriate lag lengths, the criteria provided by the Akaike and Schwarz Information criterion and diagnostic tests were applied.

To measure the pass-through coefficients, impulse response functions were applied.[7] Impulse response functions trace out the dynamic effects on prices originating from a one-time shock to the system, and account for disturbances of the other endogenous variables. Thus, the pass-through coefficients of oil (food) prices were obtained by dividing the cumulative impulse responses of each price index after j months by the cumulative response of the oil price after j months to the oil (food) price shock.

Empirical results

We report the results of the pass-through of global oil prices to domestic inflation in the first subsection and do the same for global food prices in the second subsection.

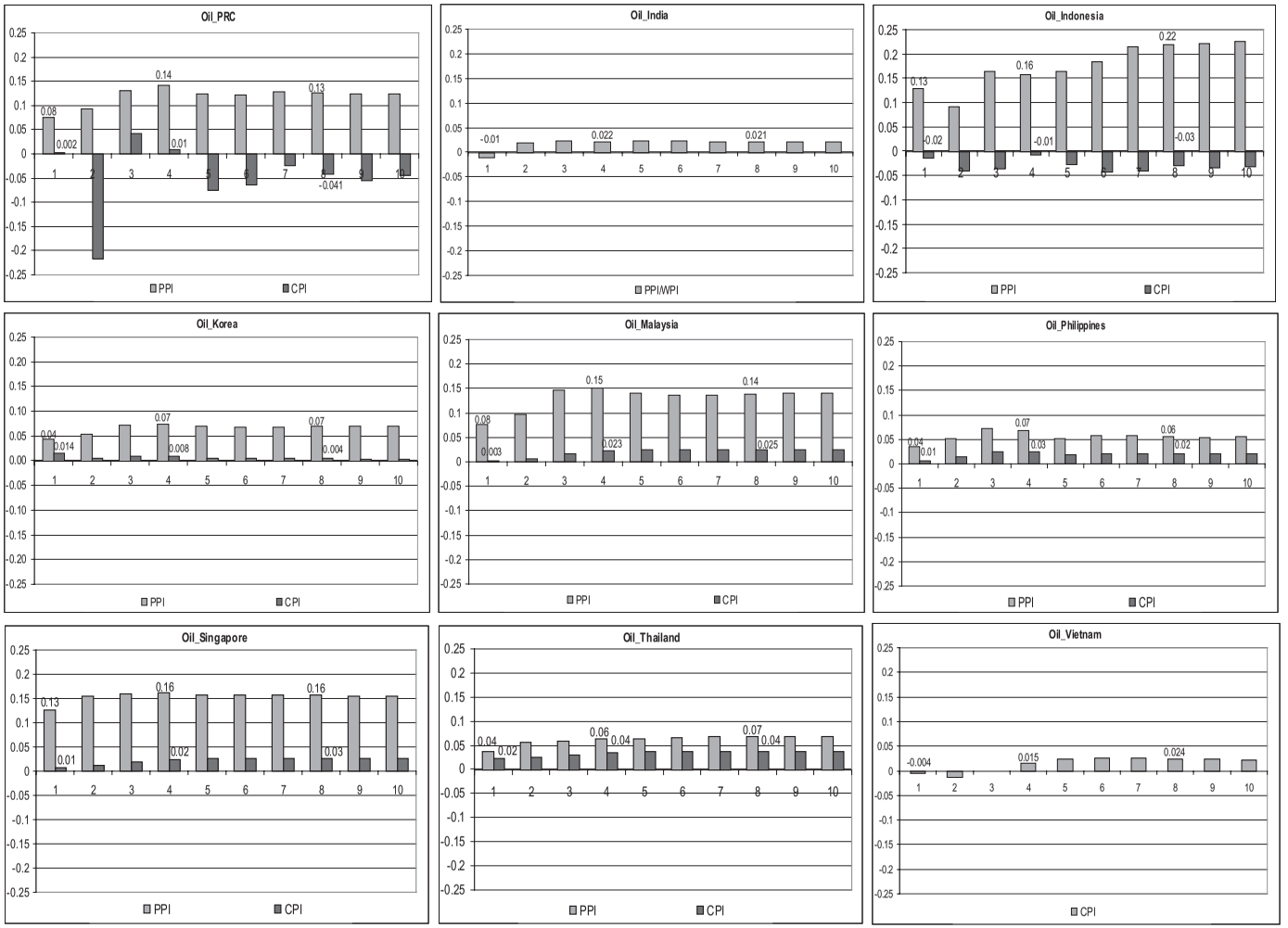
Pass-through of the global oil price shock to domestic inflation

The empirical analysis of the effect of global oil prices on developing Asia's inflation yields three central results. First, as Figure 5 shows, the pass-through of oil prices to producer prices tends to be higher in oil-exporting

6 The 21 food commodity products comprising the index are bananas, maize, rice, wheat, beef, lamb, swine meat, poultry, coconut oil, fishmeal, groundnuts, olive oil, palm oil, soybeans, soybean meal, soybean oil, sunflower oil, fish and shrimp, oranges, and sugars.

7 Impulse response functions for the nine countries are available upon request from the authors.

Figure 5
The cumulative coefficients of oil price pass-through (unit: per cent)



Note: Y-axis reflects pass-through coefficients obtained by dividing the cumulative impulse responses of each price index after j months by the cumulative response of the oil price after j months of the oil price shock. This could be interpreted as the percentage change in domestic prices (producer and consumer), resulting from a per cent change in oil prices. X-axis is the time period, which is on a quarterly basis in the study.
Source: Authors' estimates.

Table 1
Oil dependency and energy efficiency for selected countries, 1995, 2003, and 2005

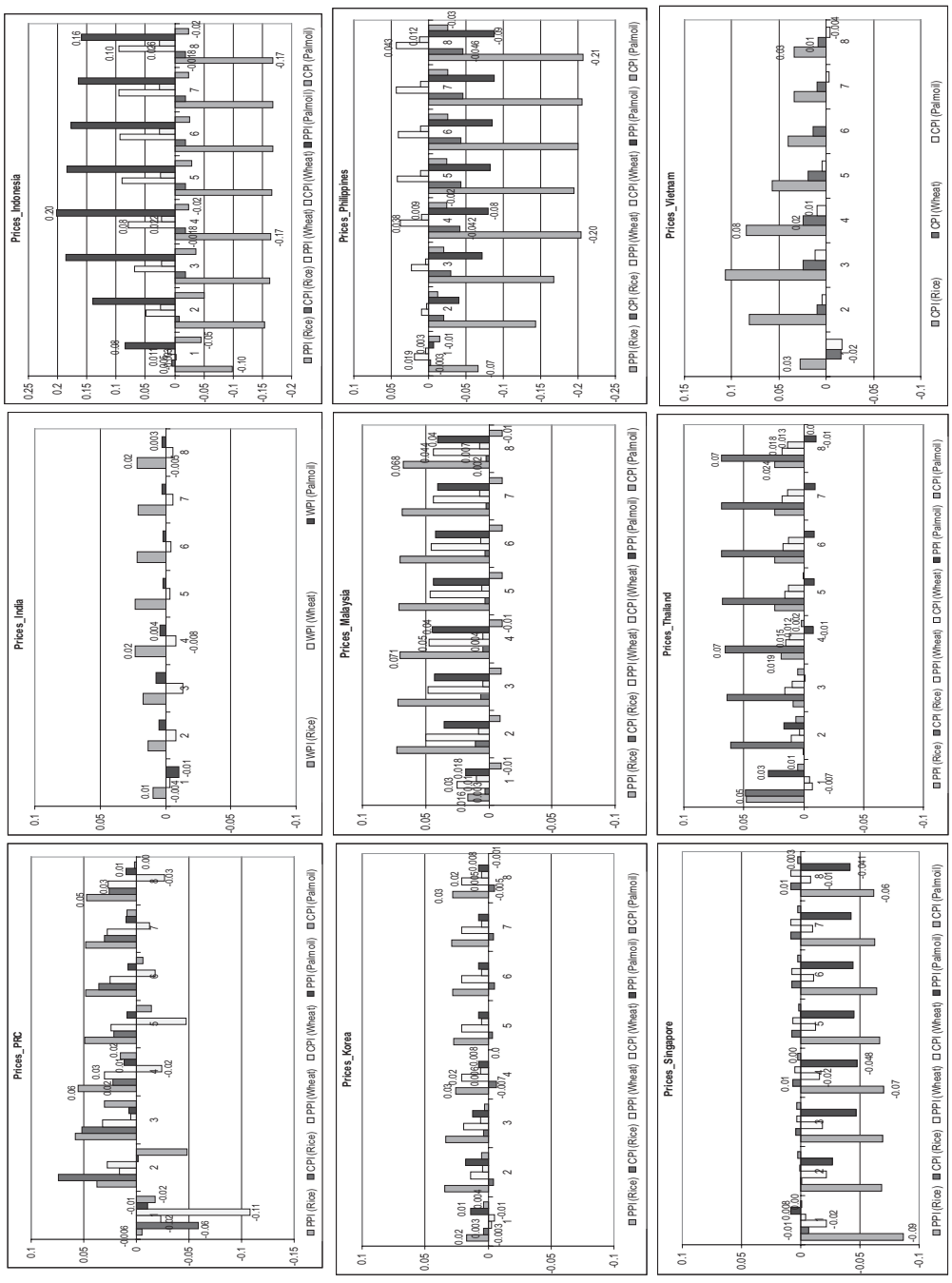
	Oil self-sufficiency			Intensity of oil use (%)			Energy efficiency		
Region/country	1995	2003	2005	1995	2003	2005	1995	2003	2005
United States	–0.6	–0.7	–0.8	37.8	39.5	40.1	12.4	9.0	8.1
Euro Zone	–0.6	–0.6	–0.6	43.5	41.3	40.8	6.9	6.2	5.3
Japan	–1.0	–1.0	–1.0	55.7	49.8	48.2	3.9	5.2	5.0
East Asia* excluding Japan	–0.1	–0.4	–0.5	26.0	24.3	23.7	47.9	30.9	29.9
China	–0.1	–0.4	–0.5	20.1	22.6	20.5	47.9	30.9	29.9
Hong Kong, China	–1.0	–1.0	–1.0	62.7	61.4	60.2	4.4	6.0	5.8
Korea	–1.0	–1.0	–1.0	66.0	51.6	48.6	12.3	14.3	11.7
Taipei,China	–1.0	–1.0	–1.0	54.5	46.2	45.0	10.5	13.8	12.6
Southeast Asia*	0.0	–0.2	–0.3	57.7	49.0	47.8	15.1	20.7	18.4
Indonesia	0.9	0.0	–0.2	51.8	50.4	48.9	16.1	20.0	18.7
Malaysia	0.7	0.5	0.3	56.4	39.9	39.7	16.5	23.3	18.6
Philippines	–1.0	–1.0	–0.9	72.1	54.4	52.5	13.0	15.8	13.5
Singapore	–1.0	–1.0	–1.0	95.3	88.3	87.9	14.1	18.2	17.3
Thailand	–0.9	–0.8	–0.8	67.2	53.2	52.8	12.6	22.6	20.6
Viet Nam	0.8	0.6	0.5	9.4	13.8	14.6	24.5	24.7	23.1
South Asia*	–0.6	–0.7	–0.8	30.6	34.5	31.5	28.8	22.4	19.2
India	–0.6	–0.7	–0.7	28.7	33.7	30.8	32.1	23.7	20.1
Sri Lanka	–1.0	–1.0	–1.0	68.9	81.9	82.6	11.2	11.0	9.0
Pacific*	2.5	0.2	2.1	77.0	80.5	81.6	10.3	15.8	11.7
Central Asia*	0.0	1.5	1.8	28.7	20.8	19.8	118.6	99.4	67.2
World	–0.1	–0.1	–0.1	39.0	37.7	36.6	12.3	11.5	10.3

* The classifications of the different sub-regions of Asia follow the Asian Development Bank (ADB) classifications. Please refer to www.adb.org for more details.
Note: The oil self-sufficiency index is oil production less consumption divided by consumption; a positive number indicates some degree of self-sufficiency. If there is no domestic oil production the index is equal to –1. Intensity of oil use in energy consumption is petroleum consumption divided by total energy consumption. Energy intensity of GDP is total energy consumption in (1,000) the British Thermal Unit (BTU) per US$ of GDP (in 2000 prices).
Source: Energy Information Administration 2005, International Energy Annual 2003. Washington, DC, available at http://www.eia.doe.gov/emeu/international/oilconsumption.html

countries than in oil-importing countries, reflecting the sharp increase in the opportunity cost of home oil consumption relative to export. For example, in Malaysia the pass-through increases from 0.08 per cent in the first quarter to a cumulative total of 0.15 per cent in the fourth quarter. Table 1 shows that Indonesia and China produce substantial amounts of oil. In those two countries, the cumulative pass-through, in response to a 1 per cent increase in oil prices, is also around 0.15 per cent after one year. For oil-importing countries, the cumulative annual pass-through of oil prices to producer prices is somewhat smaller. Singapore is an exception. The pass-through to producer prices is high because of the high intensity of oil use in total energy consumption. Table 1 shows that while the intensity of oil use in total energy consumption was almost 90 per cent in Singapore, it was less than 55 per cent for all other countries.

Second, the impact of crude oil price increases on domestic prices is diluted along the distribution chain. Thus, the pass-through coefficients tend to be lower for consumer prices than for producer prices. The gap between these two price indices depends on the ability of firms to pass higher costs onto consumers. For example, in the face of intense competition, producers may cut profit margins instead of immediately charging higher prices to consumers. Government policy

Figure 6
The cumulative coefficients of food price pass-through (unit: per cent)



Note: Y-axis reflects pass-through coefficients obtained by dividing the cumulative impulse responses of each price index after j months by the cumulative response of the oil price after j months of the oil price shock. This could be interpreted as the percentage change in domestic prices (producer and consumer), resulting from a per cent change in oil prices. *X*-axis is the time period, which is on a quarterly basis in the study.
Source: Authors' estimates.

measures, for example, fuel subsidies, electricity subsidies, and price controls, reduce or delay the pass-through of oil price increases to consumer price inflation. Figure 5 shows that the gap between pass-through to producer prices and pass-through to consumer prices is rather narrow in Thailand and the Philippines compared with the other countries.

Third, the degree of oil price pass-through to consumer prices is higher for countries with limited fuel subsidies. The Philippines, Thailand, Malaysia, and Indonesia have comparable energy efficiency levels, but the former two have lower consumer subsidies than the latter two oil producers. The pass-through to consumer prices is higher in the Philippines and Thailand, about 0.04 per cent after one year, than in Malaysia and Indonesia, less than 0.02 per cent. Although the level of energy efficiency is relatively low in the PRC, India, and Viet Nam—total energy consumption to GDP in 2005 was 30 per cent in the PRC and around 20 per cent in India and Vietnam—fuel price subsidies limit the impact of oil price increases on consumer prices. In the PRC, the pass-through to consumer prices is negative after two quarters and turns slightly positive in the third and fourth quarters. This result shows that price controls and other government interventions may have cushioned the consumers from the full burden of rising fuel costs. Similarly, in India and Viet Nam, the pass-through coefficient is negative in the first quarter but turns slightly positive after one year. Korea is an exceptional case in the sense that the low pass-through to consumer prices was due to superior energy efficiency (that is, total energy consumption to GDP in 2005 was 11 per cent) rather than fuel subsidies.

Pass-through of global food price shocks to domestic inflation

The analysis of the effects of global food prices on developing Asia's inflation yields three central results. First, as Figure 6 shows, the pass-through to producer prices is higher in food-exporting countries than in food-importing countries. The higher pass-through in food-exporting countries provides farmers in those countries with incentives to expand their production. In rice-exporting countries, that is, Thailand (35 per cent of global rice exports), India (17 per cent), and the PRC (3 per cent), producer prices increase by a cumulative total of 0.02–0.06 per cent after one year in response to a 1 per cent rise in the world rice price. In contrast, the pass-through coefficients are negative for Indonesia, the Philippines, and Singapore. The pass-through of palm oil prices to producer prices is higher in Indonesia and Malaysia (large palm oil exporters) than in the other countries. In Indonesia, producer prices rose by 0.08 per cent in the first quarter and by a cumulative total of 0.2 per cent after one year. In Malaysia, producer prices rose by 0.02 per cent in the first quarter and a cumulative total of 0.04 per cent after one year. For the other countries, producer prices increased by less than 0.03 per cent after one year in response to a 1 per cent rise in palm oil prices. The pass-through of wheat prices in India, a net wheat exporter, is an exception. The pass-through is limited largely as a result of government subsidies. Note that a slight decline of the pass-through to producer prices in many countries results from the supply response to food price increases.

Second, palm oil pass-through coefficients tend to reflect the low share of vegetable oils in the consumption basket,[8] and the pass-through coefficients to consumer prices for palm oil tend to be lower than for rice or wheat. The exceptions are China and India, where wheat has a lower pass-through. Table 2 shows that the average per capita consumption of palm oil and vegetable oils for the nine countries as a whole was 3.2 and 9.5 kg, respectively. The corresponding numbers for wheat and rice are 39 and 102 kg, respectively. In Vietnam, for example, the cumulative pass-through of rice prices to consumer prices is 0.08 per cent after

8 The share of food expenditure in the consumption basket in the Consumer Price Index (CPI) is a better indicator of the degree of food pass-through to domestic prices. However, because of data limitations, this study uses consumption per capita to proxy the importance of each food product in the consumption basket.

Table 2
Per capita consumption of key agriculture products for selected countries, 1995–2003

	Wheat			Rice			Palm oil		
Region/country	1995	2000	2003	1995	2000	2003	1995	2000	2003
People's Republic of China	79.3	74.1	61.4	91.3	87.6	78.5	1.1	1.0	1.5
India	63.6	57.2	63.6	80.7	74.7	71.1	0.8	3.1	3.4
Indonesia	21.3	19.4	17.3	146.5	148.9	141.1	7.1	7.7	7.9
Korea	48.7	52.9	48.4	95.3	87.8	77.7	1.2	1.9	2.7
Malaysia	65.6	35.6	65.6	86.8	86.1	70.8	7.5	6.1	6.2
Philippines	31.5	27.0	29.7	94.3	106.4	110.6	0.8	1.6	1.0
Singapore	..	..	..	..	..	..	..	..	..
Thailand	9.2	10.5	11.5	105.6	106.3	104.4	2.5	2.7	2.6
Vietnam	6.0	8.1	10.1	163.0	169.6	169.1	0.0	0.0	0.0
Asia	69.2	66.4	63.5	87.1	84.3	79.4	1.7	2.3	2.7
Latin America	51.5	49.0	52.5	22.8	26.2	26.0	1.5	1.6	1.9
Developing countries	62.3	60.2	58.6	71.4	69.4	65.7	1.9	2.3	2.7
World	71.0	68.4	67.0	57.6	56.8	54.2	1.6	2.0	2.2

Source: Food and Agriculture Organization of the United Nations, available at http://faostat.fao.org/site/502/DesktopDefault.aspx?PageID=502

one year compared with 0.02 per cent for wheat and 0.01 per cent for palm oil. In Thailand, the cumulative pass-through of palm oil, wheat, and rice prices to consumer prices after one year are 0.002, 0.01, and 0.07 per cent, respectively.

Third, food subsidies limit the degree of pass-through to consumer prices in many Asian countries. Table 2 shows that the per capita rice consumption of the Philippines and Indonesia is relatively high at 110 and 141 kg, respectively, and comparable with China, Thailand, and Vietnam. However, high subsidy levels limit the pass-through in the former two countries (see ADB 2008b). The pass-through coefficient is also negative or very low for Korea and Malaysia. This is a result of both the small share of rice in the consumption basket and the existence of rice subsidies. For wheat, there is a negative pass-through to wholesale prices in India and a very limited pass-through to consumer prices in Malaysia. As the two countries are relatively heavy wheat consumers at more than 60 kg per capita, the limited pass-through is probably due in large part to government policies that impede the adjustment of domestic prices to international wheat prices. In Indonesia and Malaysia, government policies such as export taxes and price controls on cooking oils limit the pass-through of palm oil prices to consumer prices. The per capita consumption of palm oil in these two countries is around 6–8 kg, substantially higher than the average of 3.2 kg for the nine countries.

Concluding observations and policy implications

The central finding that emerges from the analysis is that in developing Asia the pass-through of global food and oil price shocks to domestic prices has been very limited. While there are differences across countries, the clear pattern is that consumers bore the cost of only a small part of the increase in global food and oil prices. This finding is somewhat surprising in light of the almost perfect coincidence between the region's inflation surge of 2007–08 and the spike in global commodity prices. The analysis implies that the various obstacles to pass-through have been strong enough to seriously dilute the impact of global commodity prices on domestic inflation. In particular, the

fuel and food subsidies provided by many Asian governments create a sizable wedge between global market prices and domestic prices. Furthermore, the results suggest that Asian producers are reluctant to pass on higher input costs to consumers, at least in the short run. In short, government policy and producer behaviour can explain the limited pass-through in Asia.

The findings also have substantial implications for policymakers in the region, especially for monetary authorities. The limited effect of the global food and oil price shocks on domestic prices suggests that developing Asia's inflation surge of 2007–08 was driven largely by demand-pull factors rather than cost-push factors. This result stands out in sharp contrast to the widely held view that Asia's inflation surge was largely driven by externally determined commodity prices about which the monetary authorities could do nothing. The sustained boom of the region's economies, as well as the generally loose stance of monetary policy throughout the region prior to the current global slowdown, suggests that home-grown factors may have played a more significant role in the inflation surge. That is, strong domestic demand and inflationary expectations fuelled by lax monetary policy may better explain the spike in the region's inflation during 2007–08 than the oil and food price shocks. Asian monetary authorities would do well to keep this lesson in mind when the world economy recovers.

Finally, while global food and oil prices fell substantially, they are unlikely to remain weak in the medium to long term. While the surge in food and oil prices was driven largely by structural factors such as the economic transformation of the PRC and India and a long-term increase in demand from the two giants, the recent moderation of commodity prices is the product of a cyclical downturn in global demand for commodities. Although the severity and duration of the current global slump is unclear, the structural determinants of global commodity prices will reassert themselves when global economic growth reverts to its long-run trajectory. Although a pro-growth, expansionary, monetary policy stance is appropriate in the context of the current global crisis, when normalcy returns monetary authorities in developing Asia would do well to remember that monetary policy matters a lot for inflation, even in the face of exogenous commodity price shocks. There is also good reason to believe that the pass-through to domestic inflation will be faster and larger when those shocks return. This is because regional governments reduced subsidies, especially for fuel, during 2007–08 in response to their unsustainable fiscal costs.

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